Work from home, polarization, and new residential construction during COVID-19

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Abstract

This article examines the effect of the COVID-19 pandemic and work-from-home trends on residential construction. We document a decline in building permits filed early in the pandemic, followed by a substantial increase in permits filed during late 2020 and 2021. Pre-pandemic trends of building in urban areas continued, while substantially more permits were filed in Republican-voting counties and counties in states with Republican governors. Our results suggest political re-sorting during the pandemic that may continue in a work-from-home environment.

Keywords: Work from home, polarization, COVID-19, construction, housing

JEL codes: O18, O33, R10, R21, R31

1 Introduction

COVID-19 and the ability to work from home drastically changed the value of housing and geographic distribution of local amenities, contributing in part to record home price increases of over 19 percent in 2021 (Bahney, 2022). Population density, previously a source of agglomeration benefits (Glaeser, 2008), was suddenly less valuable with the ability to work from home and the desire to social distance. Controversial differences in pandemic

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policy responses invited households to vote with their feet and relocate to locations with a preferred mix of local amenities and policies (Tiebout, 1956). Thus, there is a critical need to develop empirical estimates of where people moved in response to the changes brought by the pandemic. Knowledge of changes in the housing stock in response to the pandemic provides policymakers a crucial preview of where households will choose to locate in a future with more options to work from home.

Our objective is to provide empirical estimates of how households relocated during the pandemic by analyzing patterns in residential building permits. First, we hypothesize that new construction slowed during the early months of the pandemic, but that it increased after lockdown policies expired and economic behavior began to normalize. We further hypothesize that households constructed new housing in areas with lower population density and fewer urban amenities given restrictions on gathering during the pandemic. Finally, we expect that lockdown policies may have restricted construction opportunities in states with Democratic Party Governors in 2020, but we also expect that this difference would attenuate in 2021.

To test these hypotheses, we analyze county building permits data collected by the US Department of Housing and Urban Development (HUD). Our empirical strategy compares housing permit filing rates in counties before and after the pandemic, depending on controls for county-level COVID-19 case rates, county fixed effects, and time indicators to control for unobserved confounders. While new construction is only one component of migration and relocation, we interpret new construction as a strong signal of the investment of capital in a location. The number of permits filed include single and multi-family residential buildings, providing a comprehensive characterization of new housing investment. Furthermore, these data have the advantage of being collected monthly for decades and covering most of the United States at the county level. Migration surveys faced additional difficulty with nonresponse during the pandemic, and housing transaction data are restricted and costly to obtain for the entire United States. For example, the widely used CPS ASEC survey has suffered from nonresponse bias in 2020 and 2021 (Rothbaum and Hokayem, 2021). In

contrast to new location data sources which capture short-term movement better (such as address change (Brueckner et al., 2023) and cell phone location data (Althoff et al., 2022), our data on housing permits extends back to 2000, which places the changes wrought by COVID-19 in context with historical patterns. Furthermore, a building permit is a costly signal of the intent to invest capital long term in a fixed location, while a change of address and cell-phone location are a better reflection of short term location. For instance, we find that relative increases in building permits in low-population density areas looks large in 2020-2021 relative to 2018-2019, but when placed in historical context this is merely a continuation of trends that existed prior to the pandemic. We believe that our data provides a much-needed consistent and up-to-date measure of mobility at a broad geographic and time scale.

We estimate that new residential construction permits were 15%, 30% and 25% below normal levels in March, April, and May 2020, but that permit application rates were back to normal by September 2020. From September 2020 to December 2021, monthly permit filings were at or above pre-pandemic levels, with the largest increases coming in the winter months. We find that more building permits were filed in urban/metropolitan counties and fewer permits were filed in rural counties relative to suburban counties, but these trends were present before the pandemic. We do not see a statistically significant change in the share of permits filed in above-median population density counties. Contrary to our hypotheses, our estimates do not suggest a large trend-break in the location of new construction.

Our most intriguing finding is that there was a substantial shift in new builds toward counties in states with a Republican Governor and counties where a majority of residents voted for the Republican Party candidate in the 2016 presidential election. While our estimates suggest that this has been a slight trend since 2012 or 2013, the strength of the trend doubled in 2020 and remained strong in 2021. While we expected temporary declines in construction in states with Democratic Party Governors due to more restrictive lockdown policies, we did not expect the effect to persist into 2021. Furthermore, the findings of increased builds in counties with higher Republican vote share could reflect sorting based

on local pandemic policies or a deeper sorting by political affiliation. In a future with more mobility from work-from-home, assorting geographically based on political viewpoints comes at a lower cost.

In the next section, we discuss the related literature and our study's contribution. Next, we outline our hypotheses. We then introduce our data, empirical strategy, and results. Finally, we conclude and consider implications for a society with broader access to remote work.

2 Related literature

Other papers have investigated work-from-home, location, and the housing market during the COVID-19 pandemic, primarily focusing on the household's choice of home location relative to the workplace and other amenities. Several theoretical models predict that the ability to remote work will result in households living further from jobs and the central business district (Davis et al., 2021; Delventhal et al., 2022) and increased income and economic welfare inequality between those who can and cannot work remotely (Behrens et al., 2021; Delventhal and Parkhomenko, 2022). Brueckner et al. (2023) develop a theoretical hedonic model that predicts that the ability to work from home allows workers to move away from jobs and toward amenities, resulting in new labor market and housing market equilibria. In these new equilibria, wages equalize across locations due to the ability to work from anywhere, while housing prices change to reflect non-job amenities. Empirically, they find support for their model's hedonic price predictions, and find evidence that there were larger outflows from high-productivity counties with jobs amenable to work-from-home. Similarly, Althoff et al. (2022) provide empirical evidence that cities with high population density and a large fraction of business-sector workers had the largest shift to remote work, and counties with a large fraction of business-sector workers saw large population outflows during the pandemic.

Several studies considered changes in housing prices immediately after the pandemic

began. Bricongne et al. (2023) document an immediate reduction in housing prices in London with an increase in housing prices in the rest of the United Kingdom. In Norway, housing sales and prices fell during the lockdown but quickly increased after reopening (Anundsen et al., 2023). Gamber et al. (2023) find that increased time spent at home during the pandemic was correlated with housing price increases, which is consistent with a changing value of home amenities due to the pandemic and work-from-home options.

Our paper builds upon the idea that work-from-home reduces the cost of distance to workplace, and provides the insight that the value of urban/rural amenities and political affiliations changed with the pandemic. Unlike in previous studies, our outcome variable is available going back to 2000, which is important to show that many changes from 2019-2020 are continuations of decade-long trends rather than new pandemic-related shocks. For example, our estimates differ from Brueckner et al. (2023) and Althoff et al. (2022) who observe movement away from high-density and high-productivity areas. Furthermore, our outcome variable may be interpreted as having longer-run implications because building permits are a costlier and more permanent signal of location choice than change of address or cell phone location.

Another related literature examines political polarization generally and in relation to the COVID-19 pandemic. Prior to the pandemic, there was evidence of a large degree of geographic segregation by voter registration status (Brown and Enos, 2021). In addition, there is some evidence that households sort into politically polarized neighborhoods, but this mechanism does not cause enough variation to fully explain the degree of geographic segregation in the United States (Martin and Webster, 2020). Responses to the COVID-19 pandemic were polarized politically. Democrat-leaning individuals had a higher perception of the health risks of COVID-19 and were more likely to report social distancing and mask wearing (Bruine de Bruin et al., 2020). Areas with more Democratic Party voters had higher levels of social distancing as measured by cell phone location data (Allcott et al., 2020). Our paper's findings suggest that COVID-19 policy debates may have contributed to polarization driving additional sorting and geographic segregation by political affiliation.

This geographic segregation has potential to be a persistent secondary effect of the pandemic on the US political landscape.

3 Hypotheses

Our hypotheses are based on a Tiebout-style conception of residential sorting, which predicts that households will vote with their feet and choose to live in locations that satisfy their preferences for public good amenities (Tiebout, 1956). Before the pandemic, households selected locations that traded off the varieties and levels of amenities with distance to workplace and cost of living in a location. The pandemic brought two sets of changes likely to disrupt the spatial equilibrium of the pre-pandemic world. First, the value of amenities changed. For example, pre-pandemic, population density conferred cultural and productivity benefits, making cities a vibrant and lucrative place to live. During the pandemic, population density was viewed as potentially a vector for disease transmission and many cultural benefits of density were of lower value.[1] In addition, local policy responses to the pandemic could themselves be interpreted as an amenity or disamenity. Second, the cost of distance to workplace went nearly to zero for business-class workers as work-from-home became an important part of the COVID-19 pandemic response.

Our first hypothesis is that the change in value of amenities and cost of distance to workplace during the pandemic gave households an incentive to relocate if the differential utility of a new location exceeded the cost of moving. At the beginning of the pandemic, moves may have been limited by initial lockdown policies and cautious behavior, but we expect that after stay-at-home behavior began to end that households began to relocate. We expect this early lockdown effect to be particularly strong in states with Democratic Party governors and localities with Democratic Party voters given the Democratic Party's support for stricter lockdown policies. Our second hypothesis is that areas with Democratic Party politicans and supporters will see less relocation early in the pandemic, but that this

[1] After the pandemic, work by Ellen et al. (2023) did not find evidence that urban density increased COVID-19 case rates.

effect will not persist.

This further suggests that areas where jobs and people were concentrated were a source of potential movers, and that areas with fewer jobs and people but other amenities were a destination. Thus, our final hypothesis is that people moved toward low-population-density areas and rural/suburban areas from high-population-density and urban areas. While some of the moves may be temporary, we expect that the landscape of local amenities changed enough to spur new investment and construction in locations where amenities increased.

4 Data

The primary outcome data are monthly counts of permitted buildings by county across the United States from 2000-2021 collected in the Building Permits Survey conducted by the United States Census Bureau (2021). Permitting agencies report the number of permits filed for new single-family and multi-family construction each month to the Census Bureau. While not all counties report to the survey, the Census Bureau estimates that the survey captures 99% of new residential construction in the United States.[2]

We supplement the building permits with data on population density, urban-rural status, 2016 Democratic presidential candidate vote share, gubernatorial party affiliation, and COVID-19 cases. The population density data reflects population density and land areas from the 2010 Census (U.S. Census Bureau, 2011). We use the USDA's Rural Urban Continuum Code status to characterize population and urban-rural status (USDA, 2020). The Rural Urban Continuum includes nine categories ranging from low-population-rural to suburban and high-population-metropolitan. We characterize major metropolitan counties with populations of 250,000 and above as urban, counties adjacent to urban counties as suburban, and all other low-population counties as rural. In our analyses, we use suburban as the omitted base category. We obtain 2016 presidential election county vote shares the MIT Election Data and Science Lab (2018), and gubernatorial party from Kaplan (2021). Finally, we use

[2]We use the raw reported data in our analysis rather than the Census Bureau's smoothed and imputed data.

	(1) 2018-2019 Share permits (std dev)	(2) 2020-2021 Share permits (std dev)	(3) Difference (t-stat)
Above median pop density	0.93	0.93	-0.005
	(0.25)	(0.26)	(-21.2)
Urban	0.96	0.96	-0.001
	(0.19)	(0.19)	(-7.6)
Suburban	0.02	0.02	0.001
	(0.15)	(0.15)	(10.2)
Rural	0.01	0.01	$>$ -0.001
	(0.11)	(0.11)	(-1.3)
Majority voted Democrat	0.48	0.44	-0.042
	(0.50)	(0.50)	(-96.1)
Democratic Party Governor	0.34	0.40	0.058
	(0.47)	(0.49)	(138.7)
Total permits	2,401,031	2,821,518	420,487

Table 1: Share of permits by county, comparing 2018-2019 with 2020-2021. Two-way t-test assumes unequal variances and has critical value of $t = 1.96$ for significance at the 5% threshold.

the New York Times county level COVID-19 case counts to control for new daily cases (NY Times, 2022).

Table 1 displays the share of permits by county type in the two years before and during the pandemic. A vast majority of new residential construction takes place in high-density, urban counties. There was less construction in Democratic-party voting counties and counties in states with Democratic Party governors relative to their Republican counterparts. Most of the differences from 2018-2019 to 2020-2021 are statistically significant (due to the large sample size), but nearly all are small and not economically meaningful. We do see that the fraction of permits filed in Democratic-party voting counties decreases and the fraction of permits in states with Democratic Party governor increases, but the latter simply reflects newly elected Democratic Party governors.

5 Empirical strategy and results

We begin by estimating the dynamic effect of the pandemic on the number of construction permits filed each month of 2020-2021. Intuitively, our empirical strategy compares the difference in building permits filed within a county in each month during the pandemic relative to the expected permits filed during the same month in the pre-pandemic period. Denote $Y_{i,t}$ the number of permits filed in county i in month t. Our regressions use the inverse hyperbolic sine of permits as the outcome variable so that we can interpret the coefficients as approximately a percentage change.[3] Denote January 2020 as $t = 0$ so that months before 2020 are negative and months after 2020 are positive. We estimate the following regression using ordinary least squares:

$$\sinh^{-1}(Y_{i,t}) = \alpha_i + \mu_{month} + \sum_{s=-12}^{11} \beta_s 1(t = s) + \varepsilon_{i,t}, \tag{1}$$

where α_i is a county fixed effect, μ_{month} is a set of month-of-year indicator variables, $1(t = s)$ is an indicator variable equal to one in month s, and and $\varepsilon_{i,t}$ is an error term with conditional mean zero. The coefficients β_s are an estimate of the average relative percent difference in the number of permits filed in month s relative to pre-2020 in the same county and same month-of-year.

Figure 1 plots our estimated coefficients from equation 1. We cluster standard errors at the county level to account for potential heteroskedasticity and clustering within county. The estimates largely confirm our hypotheses. First, we see that the number of permits filed sharply declined in March 2020 (-14%), April 2020 (-31%), and May 2020 (-25%) relative to pre-2020. By September 2020, the number of permits filed returned to pre-2020 levels and was at or above pre-2020 levels thereafter. In the winter months, the number of permits filed was above normal, perhaps reflecting new construction delayed during the initial lockdown-policy period.

[3]The inverse hyperbolic sine function is approximately equal to the natural log function, but is defined at zero and is often used in place of the natural log when the data include many zeros.

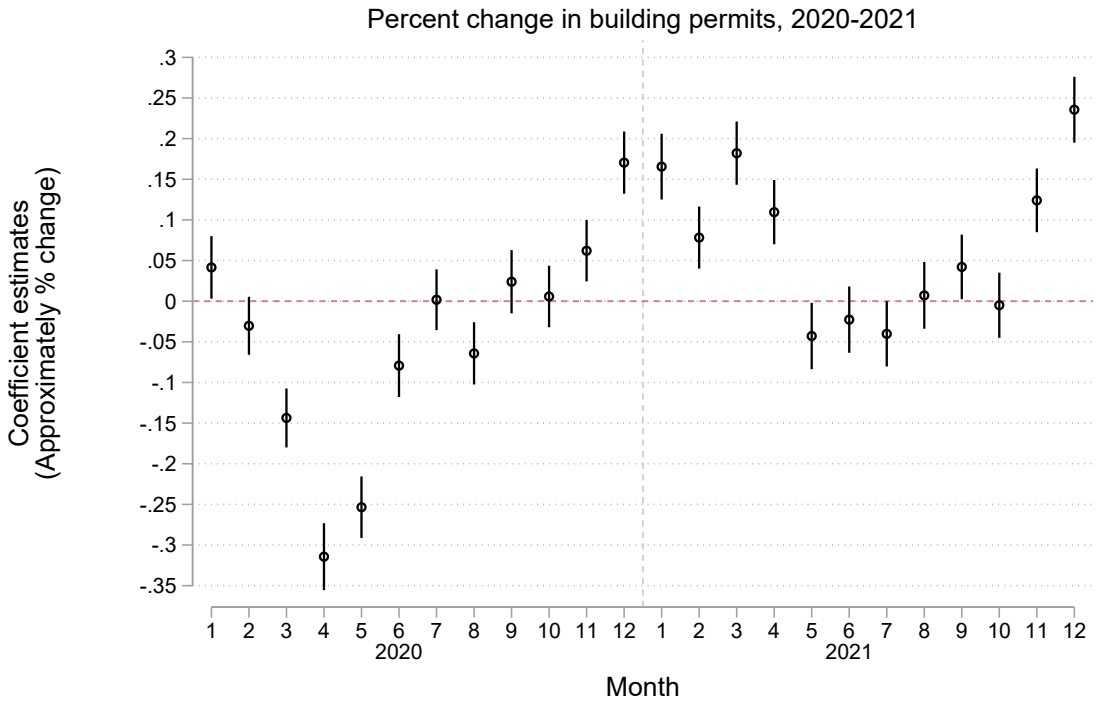


Figure 1: Regression coefficients from the estimation of equation 1, which are an estimate of the average relative percent difference in the number of permits filed in month s relative to pre-2020 in the same county and same month-of-year. Confidence intervals derived from standard errors clustered at the county level to account for heteroskedasticity.

To test our other hypotheses, we estimate a second regression that interacts county or state level covariates with year indicators to estimate the correlation of these covariates with building permits. We estimate the following regression using ordinary least squares:

$$\sinh^{-1}(Y_{i,t}) = \alpha_i + \mu_{month} + \theta X_{i,t} + \sum_{y \neq 2019} [\delta_y 1(year_t = y) + \gamma_y 1(year_t = y) X_{i,t}] + \eta_{i,t}, \quad (2)$$

where α_i is a county fixed effect, μ_{month} is a set of month-of-year indicator variables, $X_{i,t}$ is a vector of county-level covariates, $1(year_t = y)$ is an indicator variable equal to one for months in year y, and $\varepsilon_{i,t}$ is an error term with conditional mean zero. The coefficients of interest are γ_y on the interactions between year and the covariate term $X_{i,t}$. These coefficients are estimates of the conditional mean value of building permits for the covariate (all covariates of interest are coded as indicator variables for ease of interpretation). For covariates, we include an indicator for being above the median population density in the 2010 census, a set of indicators for the county's rural/suburban/urban status based on population, an indicator variable equal to one if the Democratic Party candidate received a majority vote share in 2016, and an indicator for whether there was a Democratic Party Governor. We also include the number of county COVID-19 cases interacted with year to control for the severity of the pandemic. In each case, 2019 serves as the omitted base year, so the estimated coefficients are changes relative to 2019. We caution that the estimates from this regression are correlational and should not be interpreted causally given the near certainty of unobservable factors correlated with the explanatory variables of interest.

Figure 2 displays coefficient estimates for each covariate interacted with year indicators from equation 2. 95% confidence intervals are clustered at the county level. Our estimates in panel 2a show that counties with higher-than median population density saw a small but statistically insignificant decline in new construction in 2020-2021 relative to 2019, but this estimate is very small in comparison to large year-over-year declines in the mid 2000s. Relative to suburban counties, rural counties saw a decline in building permits in 2020-2021 (figure 2b), while urban/metropolitan counties experienced continued growth in building

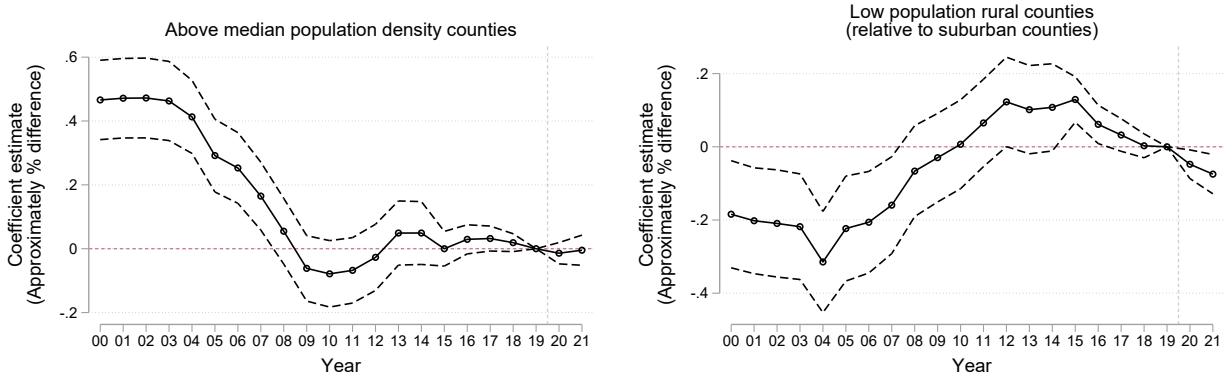
permits in 2020-2021 (figure 2c). Both the rural and urban estimates appear to be consistent with trends that have been consistent for the last decade. These findings are contrary to our hypotheses that there would be more new construction in suburban and rural counties with lower population density. Finally, we see that counties with a majority Democratic Party 2016 presidential candidate vote share (figure 2d) and with a Democratic Party governor saw large declines in building permits. These changes appear to be large relative to the changes in the last decade, but are of similar size to changes seen between 2008-2012. We discuss potential drivers for these findings in the conclusion.

6 Discussion and conclusions

Our empirical results suggest that the COVID-19 pandemic caused early declines in residential building permits in March through June 2020, but that permit levels were at or above normal levels thereafter. The early declines likely reflect lockdown policies and stay-at-home behavior, which prevented construction contractors and government permitting agencies from operating at full capacity. Following the end of formal lockdowns and subsequent stay-at-home behavior, additional permits in early winter 2020 likely reflect both delayed construction projects and new demand caused by changing preferences for location-based amenities. While delayed construction is a potential driver for early winter 2020, it is unlikely that delayed construction is a driver of additional permits in 2021. We believe that new preferences for home locations with a different mix of local amenities is the most likely explanation for the increase in building permits we document later in the pandemic.[4]

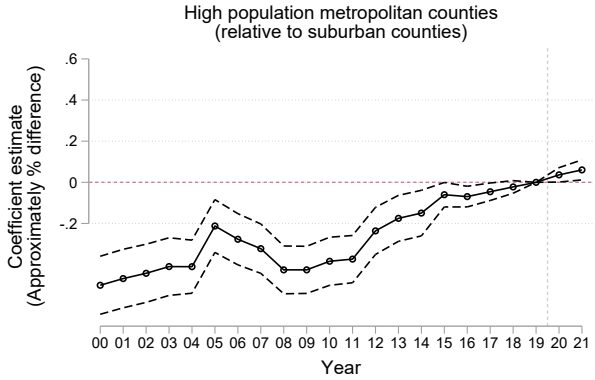
We do not find evidence to support our hypotheses that additional new building permits were filed in low population density counties, or rural and suburban counties. While we do see a decrease in permits filed in rural counties and an increase in urban/metropolitan counties relative to 2019, these differences appear to be part of decade-long trends, which

[4]Another possible explanation is increased household savings, but this appears unlikely given the size of the impact of the federal economic impact payments on the savings rate and the relatively small size of the payments to a down payment on new construction. See https://fredblog.stlouisfed.org/2021/08/personal-savings-during-the-pandemic/, for illustrative evidence on this potential driver.



(a)

(b)



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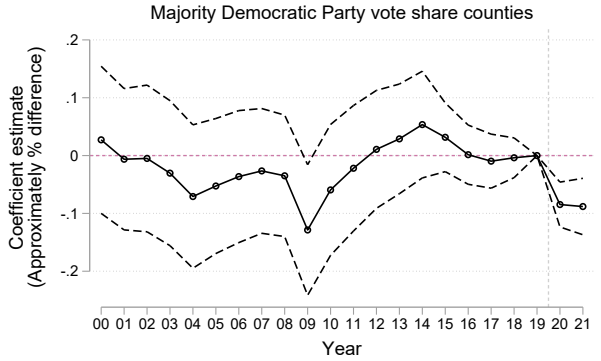

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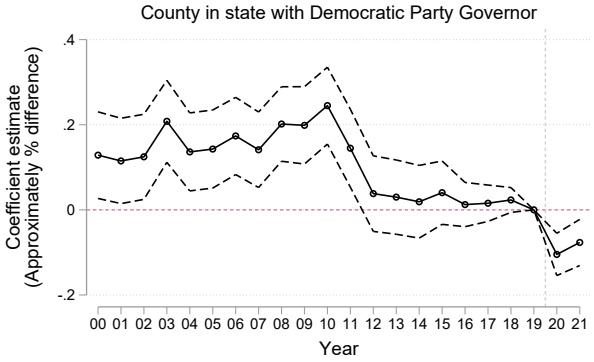

(e)

Figure 2: Coefficient estimates of covariates interacted with year indicators relative to base year 2000 from regression equation 2. The dependent variable is inverse hyperbolic sine of residential building permits. 95% confidence intervals constructed using standard errors at the county level to account for heteroskedasticity.

highlights the importance of using a longer panel to analyze the impacts of the pandemic. These estimates differ from those in the literature, most notably Brueckner et al. (2023) and Althoff et al. (2022) who observe movement away from high-density and high-productivity areas. We believe these differences arise due to our use of building permits as an outcome variable rather than change-of-address or cell-phone-location data.

A building permit is a costly signal of the intent to invest capital long term in a fixed location, while a change of address and cell-phone location are a better reflection of short term location. In the short run, we may have seen temporary movement away from cities as students and young professionals moved in with family, while long run housing stock investment continued following the same trends in these dimensions. It may simply be that the short term trends observed in other datasets were not large enough to spur investment in new housing. Alternatively, given the lag between permitting and construction completion, we cannot rule out that these permits were filed in expectation of a full return to normal.

In contrast, we find that there was a large decline in permits filed in states with a Democratic Party Governor and in counties with a majority Democratic Party vote share. These findings were persistent in both 2020 and 2021. Some of the difference in 2020 can be attributed to stronger lockdown policies and stay-at-home behavior in states with Democratic Party Governors. By 2021, most formal lockdown policies had ended, so the continued reduction in building permits in Democratic Party controlled areas relative to 2019 likely reflects larger changes in location choice along political lines. The magnitude of the changes from 2019-2021 are large, but are not unprecedented relative to recent years.

Sorting on political preferences is one potential explanation that should be explored further. Working from home relaxes a constraint on locating within commuting distance of the workplace, making it easier to assort politically. Without remote work, choosing to live in a political bubble would be very costly for workers with location-specific skills. The increase in work from home was not the only major change going on—COVID-19 policy responses were varied by state and city and the country went through a contentious election in 2020. Policies in response to COVID-19 immediately increased the heterogeneity between

states and areas with differing political control relative to prior years. Political polarization may have increased the perception that policies would differ substantially in the long run in Republican and Democratic Party controlled areas. Interestingly, prior election years were not correlated with large swings in building permitting trends, so this is not just an election-year artifact.

We are cautious in interpreting the large increase in permits in Republican Party areas relative to Democratic Party areas given the potential presence of unobserved confounding factors. One explanation may be a revealed preference for Republican gubernatorial COVID-19 policy responses, but this is of course correlated with all other Republican gubernatorial policies. Similarly, we considered that tech-sector migration from California to growing states like Texas and Florida might be driving these results, but we found that our results were similar when we dropped these states from the estimation sample (see appendix A). Thus, while our estimates are consistent with increased polarization and sorting on political preferences, we believe richer data and further research are necessary to rule out other potential explanations.

Overall, it is unclear to what extent our findings signify persistent versus temporary changes in location choice. The existing literature studying shocks on the housing market provides mixed evidence on the persistence of epidemic-related effects with some studies finding long-lasting impacts (Ambrus et al., 2020, e.g.) and others finding only transitory impacts (Francke and Korevaar, 2021; Wong, 2008, e.g.). Given that new housing stock is durable, this shock in the political location of new housing permits may be a bellwether indicator for upcoming longer-term migration in a world with more remote work and polarization.

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A Can our estimates be explained by the tech sector migration?

One potential explanation for the large increase in new builds in states with Republican governors may be the migration of tech jobs from California to states like Texas and Florida. In this section, we omit California, Texas, and Florida from the analysis and repeat the heterogeneity analysis (equation 2).

We display the coefficient estimates from the restricted sample side-by-side with the full sample in figure 3. Overall, the estimates are similar, which gives us confidence that the tech sector migration from California to states like Texas and Florida is not driving the results.

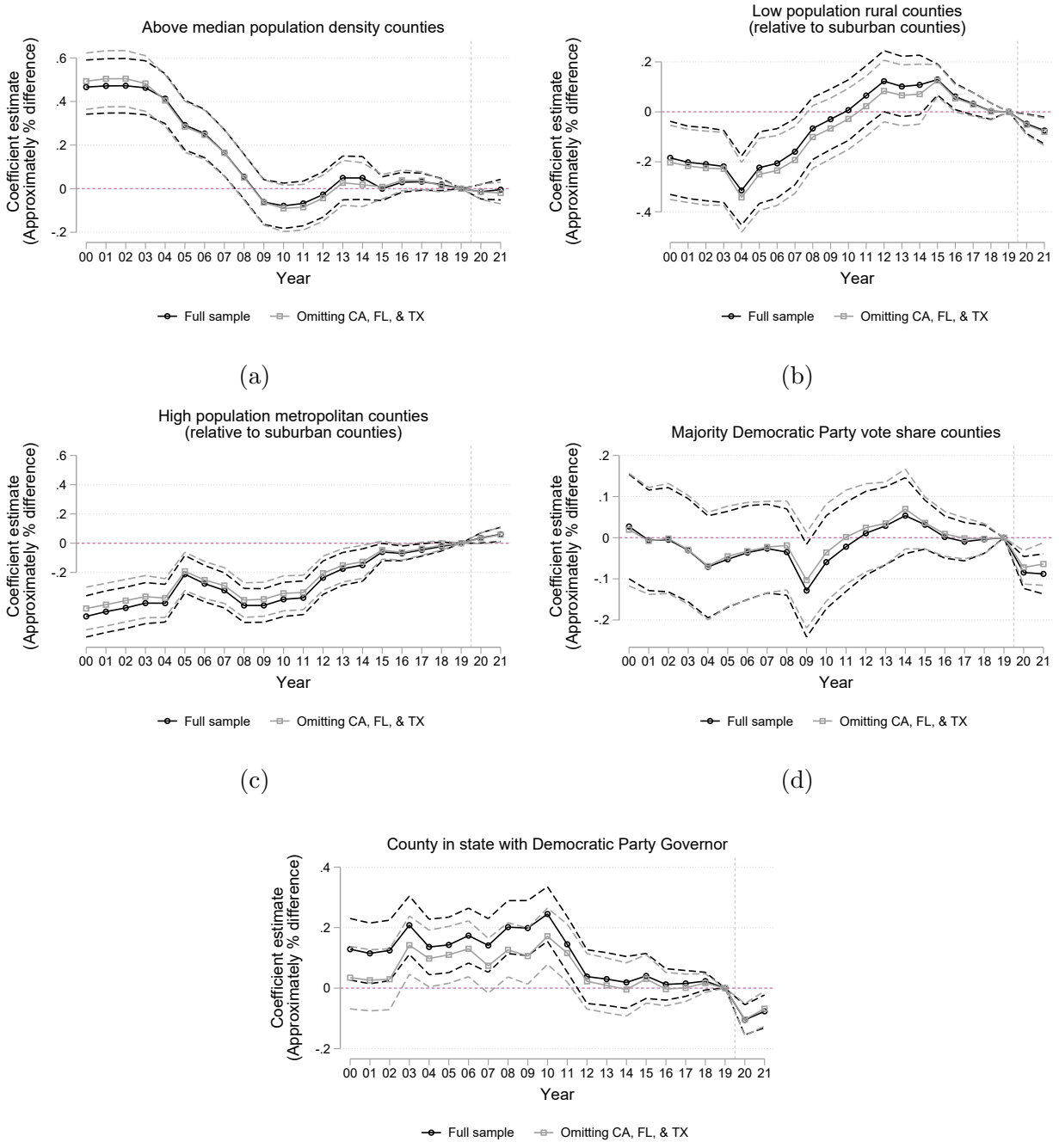

Figure 3: Coefficient estimates of covariates interacted with year indicators relative to base year 2000 from regression equation 2. The dependent variable is inverse hyperbolic sine of residential building permits. 95% confidence intervals constructed using standard errors at the county level to account for heteroskedasticity. Estimates in gray omit California, Florida, and Texas from the estimation sample.